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Research Article

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Superior Conjunctiva-Sparing Intraocular Lens-Suturing Technique with Straight Long Suture Needles Advanced from the Opposite Side

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Abstract

Background: The superior conjunctiva has to be preserved in eyes with trabeculectomy or in eyes with exfoliation glaucoma for future surgery. Under the circumstances, surgical approach for spontaneous in-the-bag intraocular lens dislocation should be limited to temporal and nasal area of the conjunctiva. A surgical technique for intraocular lens-suturing was designed to spare the superior conjunctiva.

Methods: Dislocated in-the-bag intraocular lens was removed with 25G or 27G vitreous forceps from sclerocorneal incision on the temporal side after the insertion of 25G or 27G trocars with infusion cannula. A straightened long needle with 10-0 polypropylene was inserted through the sclerocorneal incision and pierced to the nasal sclera. With pulling the suture of the nasal haptic, the optic was inserted with a forceps and then the temporal haptic with polypropylene suture was pushed into the posterior chamber. The needle head of the suture tied with the temporal haptic was inserted through the sclerocorneal incision and pushed out through the limbal side port on the nasal side. The needle head was then held with a needle holder and the needle tip was pierced to the temporal sclera. The sutures were secured on the scleral surface and vitrectomy was done to confirm no retinal detachment.

Results: The surgery was done in 18 eyes of 14 consecutive patients: 11 men and 3 women with the age at surgery ranging from 28 to 89 years (mean, 67 years); 4 patients in both eyes on separate occasions, 3 in the right eye, and 7 in the left eye. Predisposing factors for the dislocation were history of vitrectomy in 5 eyes of 4 patients, exfoliation in 6 eyes of 4 patients, history of uveitis in 6 eyes of 5 patients, and history of trabeculectomy in one eye of one patient. All patients had no surgical complication and gained significantly better visual acuity after the surgery (P=0.0008).

Conclusion: It is technically feasible and easy to advance straight needles for intraocular lens-suturing from the opposite side on the nasal-to-temporal plane to spare the superior conjunctiva.

Keywords: Trabeculectomy; Filtering surgery; In-the-bag intraocular lens dislocation; Intraocular lens-suturing; Conjunctiva-sparing

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Abbreviations

25G: 25 Gauge; 27G: 27 Gauge

Background

In-the-bag intraocular lens dislocation has become frequent in the aging population [1-10]. A most well-known background factor for the in-the-bag intraocular lens dislocation is the presence of exfoliation which predisposes cliary zonules to become sparse and thus the capsular bag to be dislocated [11]. The presence of exfoliation also leads to dysfunction of the trabecular meshwork which results in the elevation of intraocular pressure. Under the circumstances, glaucoma surgeries, often trabeculectomy with mitomycin C treatment, namely, filtering surgery, are required to control the intraocular pressure. The approach from the superior conjunctiva is crucial to perform filtering surgery successfully and to maintain the functioning bleb in a long term without causing a disastrous late complication of bleb infection [12,13]. In the era with people living longer in healthy condition, ophthalmologists have to cope with in-the-bag intraocular lens dislocation at the setting of exfoliation glaucoma (capsular glaucoma). The presence of a filtering bleb in the superior conjunctiva restricts

surgical approach to be taken on the horizontal plane of the temporal and nasal conjunctiva. In this study, I described consecutive series of patients with in-the-bag intraocular lens dislocation who underwent superior conjunctiva-sparing intraocular lens-suturing surgery.

Methods

Study design

This was a retrospective study which reviewed medical records of 18 eyes of 14 patients with superior conjunctiva-sparing intraocular lens-suturing surgery done in 5 years from January 2013 to December 2017 at Okayama University Hospital. All surgeries were done by a single surgeon (T. M.). The study conformed to the tenets of Declaration of Helsinki and was approved by Ethics Committee of Okayama University Graduate School of Medicine, Dentistry, and Pharmaceutical Sciences.

Statistics

The visual acuity in logarithm of minimal angle of resolution and cylindrical lens degrees for astigmatism before and after the surgery were compared statistically by Wilcoxon signed rank test (Statview 5.0).

Surgical procedure

The surgery was approached on the temporal side (Figure 1). Conjunctival incision was made along the corneal limbus on the temporal side. After sub-Tenon anesthesia with 2% lidocaine, three 25G or 27G trocars were inserted obliquely through the dislodged conjunctiva to the sclera into the vitreous in the inferonasal, inferotemporal, and superotemporal quadrant about 3 mm from the corneal limbus. An infusion cannula was connected to the inferonasal trocar. Sclerocorneal incision in 7 mm width was made and the dislocated in-the-bag intraocular lens was grasped with a 25G or 27G Eckardt end-gripping internal limiting membrane (ILM) forceps (Alcon, Fort Worth, TX, U.S.A.) and pulled out through the wound. In case of deeply dislocated intraocular lens in the vitreous, the intraocular lens was brought to the iris plane by a light guide or vitreous cutter after vitrectomy, and then grasped with a 25G or 27G forceps to be brought out through the sclerocorneal incision. A limbal side port was made on the nasal side around 9 o'clock, together with another side port on the inferotemporal or superotemporal quadrant. Two pieces of 10-0 polypropylene looped sutures (PC-9, Alcon) were hitched at each eyelet of two haptics of a single-piece polymethyl methacrylate (PMMA) intraocular lens with 7 mm diameter (CZ70BD, Alcon). Long-curved needles of looped polypropylene sutures were straightened by the use of two needle holders. A straightened long needle was inserted from the sclerocorneal incision and pierced to the sclera about 2 mm to 3 mm from the corneal limbus on the nasal side, avoiding the exact horizontal plane where the long posterior ciliary artery took the route. By pulling the suture of the nasal haptic, the optic of the intraocular lens was grasped with forceps and inserted into the eye. The temporal haptic with the suture was then inserted below the iris place by compression with a Sinskey hook. A straightened long needle for the temporal fixation was held near the tip end with a needle holder, and the head with the suture was inserted through the sclerocorneal incision and pushed out at the limbal side port on the nasal side. The head of the needle out of the side port was then held with a needle holder and the tip of the needle was pierced to the sclera about 2 mm to 3 mm from the corneal limbus on the temporal side. The sclerocorneal incision was stitched at 3 or 4 bites with 8-0 silk (Alcon). Two long needles for intraocular lens fixation were again sutured on the superficial sclera and secured by cutting one arm of the looped suture and being tied to the other arm after another bite on the superficial sclera. The conjunctiva was sutured with 8-0 silk. Finally, vitrectomy was done with a +128-diopter front lens by Resight 700 wide-field fundus viewing system (Carl Zeiss Meditec, Germany) to confirm no retinal detachment.

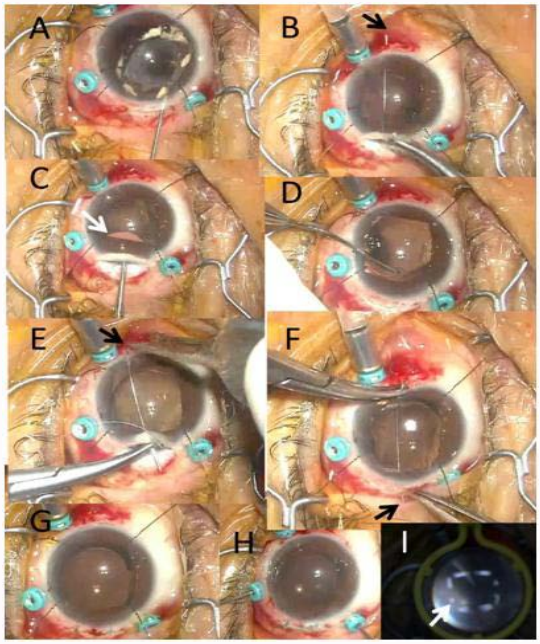

Figure 1: Surgical procedures for superior conjunctiva-sparing intraocular lens-suturing in the right eye of a 72-year-old man (Case 10) with history of vitrectomy for rhegmatogenous retinal detachment associated with acute retinal necrosis. A) Dislocated in-the-bag intraocular lens was removed with 25G vitreous forceps from sclerocorneal incision on the temporal side after the insertion of 25G trocars with infusion cannula and the placement of iris retractors. B) A straightened long needle with 10-0 polypropylene was inserted from sclerocorneal incision and pierced to the nasal sclera (black arrow). C) With pulling the suture of the nasal haptic, the optic (white arrow) was inserted with a forceps. D) The temporal haptic with polypropylene suture was compressed with a Sinskey hook into the posterior chamber. E) The needle head of the suture tied to the temporal haptic was inserted from sclerocorneal incision and pushed out through the limbal side port (black arrow). F) The needle head was then held with a needle holder and the needle tip was pierced to the temporal sclera (black arrow). G) The sutures were secured on the superficial sclera after sclerocorneal incision was stitched with 8-0 silk. H) Vitrectomy was done to confirm no retinal detachment. I) The pale optic disc (white arrow) was viewed with a +128-diopter front lens in the wide-viewing fundus with degenerative retina after acute retinal necrosis.

Results

The superior conjunctiva-sparing intraocular lens-suturing was done in 18 eyes of 14 consecutive patients: 11 men and 3 women with the age at surgery ranging from 28 to 89 years (mean, 67 years). Four patients had the surgery in both eyes on separate occasions, 3 in the right eye, and 7 in the left eye. Predisposing factors for dislocation were history of vitrectomy in 5 eyes of 4 patients, exfoliation in 6 eyes of 4 patients, history of uveitis in 6 eyes of 5 patients (Figure 2), and history of trabeculectomy with 0.04% mitomycin C treatment in one eye of one patient (Table 1). The initial cataract surgeries with in-the-bag intraocular lens implantation had been done 11.3 years as a mean, ranging from 4 to 28 years, before the intraocular lens-suturing surgeries. One patient (Case 9) became aphakic one year before the intraocular lens-suturing surgery due to traumatic corneal wound rupture of keratoplasty with concurrent prolapse and loss of the in-the-bag intraocular lens. The intraocular lenses used at the initial

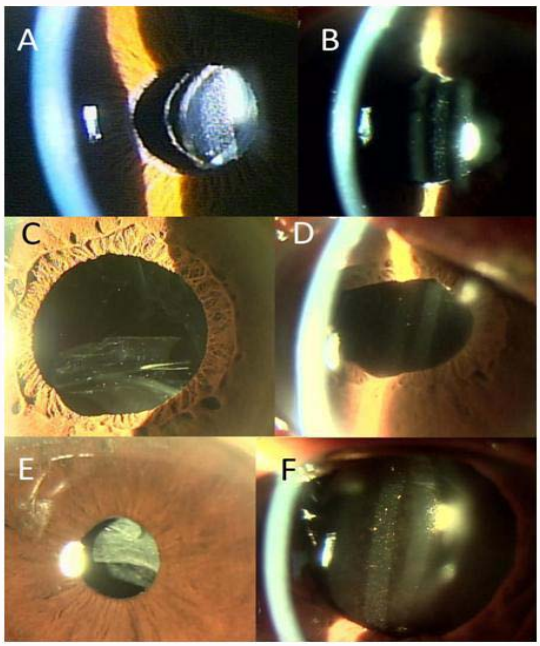

Figure 2: In-the-bag intraocular lens dislocation to the nasal side (A) and intraocular lens-suturing (B) in the right eye of a 68-year-old man (Case 5) who had a filtering bleb in the superior conjunctiva after trabeculectomy for exfoliation glaucoma. In-the-bag intraocular lens dislocation to the inferior side (C) and intraocular lens-suturing (D) in the right eye of a 70-year-old man (Case 7) with exfoliation syndrome. In-the-bag intraocular lens dislocation to the inferior side (E) and intraocular lens-suturing (F) in the right eye of a 72-year-old man (Case 10) with history of vitrectomy for rhegmatogenous retinal detachment associated with acute retinal necrosis (Figure 1).

cataract surgeries were 1-piece acryl in 12 eyes of 11 patients, 3-piece acryl in 4 eyes of 2 patients, 1-piece PMMA in one eye of one patient, and 3-piece PMMA in one eye of one patient. All patients were followed until the end of March, 2018, except for one patient (Case 3) who died at 90 years old, 2 years before the end point in March, 2018. The follow-up period after the intraocular lens-suturing surgeries was 2.6 years as a mean, with the range from 0.3 to 5.2 years (Table 1). Combined trabeculectomy with 0.04% mitomycin C treatment for 5 min was performed on the superior side in the left eye of one patient (Case 1) at the same session of the surgery after the intraocular lens-suturing procedure was finished on the temporal side. Secondary intraocular lens-suturing only was performed in the aphakic eye of another patient (Case 9) on the left side. All patients had no surgical complication (Figure 2) and gained significantly better visual acuity after the surgery (P=0.0008, Wilcoxon signed rank test, Table 1).

The intraocular pressure was elevated to 20 mmHg or higher before the surgery in 6 eyes of 5 patients (Table 1). The intraocular pressure became lower, of course, in the left eye of one patient (Case 1) with combined trabeculectomy. The intraocular pressure also became lower in the other 5 eyes of 5 patients only with intraocular lens-suturing surgery, indicative of angle closure caused by swaying intraocular lenses. At the last visit, the intraocular pressure in all patients was well-controlled without any medications in 7 eyes of 6 patients, with corticosteroid eye drops in 3 eyes of 2 patients, intraocular pressure-lowering eye drops in 3 eyes of 2 patients, combination of corticosteroid and pressure-lowering eye drops in 4 eyes of 3 patients, and combination of non-steroidal anti-inflammatory drug (NSAID) and pressure-lowering eye drops in one eye of one patient. A mean of degrees of astigmatism before the intraocular lens-suturing surgery was -2.05 diopters while a mean of degrees of astigmatism after the surgery at the final visit was -2.22 diopters. The degrees and angles of astigmatism did not change significantly before and after the intraocular lens-suturing surgery (P=0.5525, and P=3305, respectively, Wilcoxon signed rank test).

Discussion

The reason for designing the superior conjunctiva-sparing intraocular lens-suturing is to cope with in-the-bag intraocular lens dislocation in the eye with a filtering bleb in the superior conjunctiva at the setting of exfoliation glaucoma. In other cases, the intraocular pressure was elevated and the in-the-bag intraocular lens was swaying in the eye with exfoliation syndrome. A cause for the elevation of intraocular pressure in these patients might be attributed to the angle closure by a dislocated in-the-bag intraocular lens which was deviated anteriorly to push the iris plane although other causes would not be denied [14-18]. Surgical strategy is to manage the in-the-bag intraocular lens dislocation at first and hence to expect that the intraocular pressure would become low following the widening of the angle. When the intraocular pressure would still remain high after the intraocular lens-suturing, filtering surgery would be planned at the next step. Based on this sequence of surgical strategy, the superior conjunctiva would be better preserved at the first surgery of intraocular lens-suturing for a coming second surgery of trabeculectomy.

In one patient, combined surgery of trabeculectomy with intraocular lens-suturing surgery at a single session was planned and performed in the eye with exfoliation glaucoma since the level of intraocular pressure was not tolerated in a period at the advanced stage of exfoliation glaucoma. Under the circumstances, two options of surgical strategy would be taken. The first strategy is to make a scleral flap for trabeculectomy in the superior quadrant and to remove the dislocated in-the-bag intraocular lens from the sclerocorneal incision at the front of the scleral flap. In this strategy, long-curved needles for intraocular lens-suturing have to be passed blindly for a long course under the scleral flap and to be pierced to the sclera on the nasal and temporal side. The second strategy which I chose is to remove and insert the intraocular lens from the sclerocorneal incision on the temporal side at first, and then to proceed to trabeculectomy independently on the superior side. Independent surgical procedures for in-the-bag intraocular lens dislocation and for trabeculectomy were easy for a surgeon to perform, especially to advance long needles for intraocular lens-suturing. In another patient of the present series, secondary intraocular lens-suturing only was performed based on the patient's strong wish in the course of aphakia after he had experienced traumatic iris and in-the-bag intraocular lens prolapse through the corneal wound rupture of keratoplasty. The superior conjunctiva-sparing intraocular lens-suturing technique is easy and feasible to perform in the aphakic eye.

As reported in previous studies, predisposing factors for in-the-bag intraocular lens dislocation in this study are exfoliation syndrome, uveitis, and previous vitreous surgeries. Both exfoliation and uveitis are well-known underlying conditions also for the development of glaucoma, namely, exfoliation glaucoma and secondary glaucoma, respectively. The intraocular pressure would be usually elevated to a high level in exfoliation glaucoma and secondary glaucoma, and thus, filtering surgery, trabeculectomy with 0.04% mitomycin C treatment, is a standard option in case of surgical intervention. In this context, the superior conjunctiva-sparing intraocular lens-suturing is desirable from the viewpoint of future intervention of trabeculectomy at the

Table 1: Summary of 18 eyes of 14 consecutive patients who underwent superior conjunctiva-sparing intraocular lens-suturing surgery.

Case No./Gender/ Eye/Age at surgery	Predisposing factors	Initial intraocular lens implantation (Intraocular lens)	Best-corrected visual acuity Decimal (LogMAR) Astigmatism Degree (Axis)		Intraocular pressure (mmHg)		Follow-up (years)	Postoperative medications at last visit*
			Preop.	Postop.	Preop.	Postop.		
1/Female/Left/81	Exfoliation, Combined trabeculectomy at suturing surgery	5 years previously (1-piece acryl)	0.1 (1.0) -3.0 (45)	0.5 (0.3) -1.0 (60)	23	10	5.2	latanoprost dorzolamide-timolol
1/Female/Right/86	Exfoliation	10 years previously (1-piece acryl)	0.1 (1.0) -0.5 (45)	0.1 (1.0) -2.0 (160)	11	11	0.3	latanoprost dorzolamide-timolol
2/Male/Left/77	Vitrectomy for RRD 8 years previously	10 years previously (1-piece acryl)	0.1 (1.0) -1.5 (30)	0.8 (0.1) -2.5 (75)	8	8	5	None
3/Male/Left/88	Exfoliation	4 years previously (1-piece acryl)	0.2 (0.7) -0.5 (80)	0.8 (0.1) -1.0 (80)	22	12	2.5	None *Died at 90 years old
4/Male/Left/60	Left uveitis 10 years previously	20 years previously (1-piece PMMA)	0.3 (0.5) -4.0 (75)	0.6 (0.2) -1.5 (65)	27	10	4.1	latanoprost bromfenac dorzolamide-timolol
5/Male/Right/68	Trabeculectomy 6 years previously Bleb reconstruction 5 years previously	6 years previously (1-piece acryl)	0.02 (1.7) -3.0 (90)	0.7 (0.2) -3.0 (90)	13	10	3.8	Latanoprost
6/Female/Right/69	Bilateral uveitis (Harada disease) 14 years previously	13 years previously (3-piece acryl)	0.1 (1.0) -1.5 (80)	0.8 (0.1) -2.0 (90)	13	13	3.7	0.1% betamethasone
6/Female/Left/69	Bilateral uveitis (Harada disease) 14 years previously	13 years previously (3-piece acryl)	0.2 (0.7) -1.5 (50)	0.8 (0.1) -2.0 (80)	15	15	3.7	0.1% betamethasone
7/Male/Left/68	Exfoliation, iritis	28 years previously (3-piece PMMA)	0.3 (0.5) -1.5 (120)	0.5 (0.3) -2.0 (135)	31	12	3.3	0.1% fluorometholone latanoprost dorzolamide-timolol
7/Male/Right/70	Exfoliation, iritis	8 years previously (1-piece acryl)	0.2 (0.7) -1.0 (80)	0.4 (0.4) -1.0 (45)	20	14	1.7	0.1% fluorometholone latanoprost dorzolamide-timolol
8/Male/Right/28	Vitrectomy for RRD, atopic dermatitis, 13 years previously	13 years previously Atopic cataract (3-piece acryl)	0.1 (1.0) -4.0 (160)	0.1 (1.0) -4.0 (180)	16	15	2.8	None
8/Male/Left/30	Vitrectomy for RRD, atopic dermatitis, 11 years previously	14 years previously Atopic cataract (3-piece acryl)	1.0 (0) -1.0 (170)	0.8 (0.1) -4.0 (180)	17	18	0.3	None
9/Male/Left/52	Keratoplasty 11 years previously Vitrectomy for eye globe rupture with intraocular lens loss 1 year previously Aphakia at suturing surgery	12 years previously Traumatic cataract (1-piece acryl)	0.1 (1.0) -4.0 (30)	0.5 (0.3) -4.0 (15)	28	12	3.2	0.1% betamethasone carteolol-latanoprost
10/Male/Right/72	Right uveitis (acute retinal necrosis) and vitrectomy for RRD 11 years previously	11 years previously Complicated cataract (1-piece acryl)	0.04 (1.4) -1.5 (80)	0.1 (1.0) -2.0 (90)	4	7	2.4	0.1% fluorometholone
11/Male/Right/81	Vitrectomy for RRD 7 years previously	12 years previously (1-piece acryl)	0.8 (0.1) -1.5 (90)	0.8 (0.1) -1.5 (90)	14	10	2.3	None
12/Male/Left/80	Exfoliation	7 years previously (1-piece acryl)	0.8 (0.1) -3.0 (85)	1.2 (-0.1) -2.0 (85)	11	12	1.5	None
13/Female/Left/89	Bilateral uveitis	11 years previously (1-piece acryl)	0.01 (2.0) -3.0 (100)	0.3 (0.5) -2.0 (90)	19	12	1.4	latanoprost 0.1% betamethasone
14/Male/Left/41	Left uveitis, secondary macular atrophy	7 years previously Complicated cataract (1-piece acryl)	0.01 (2.0) -1.0 (60)	0.06 (1.2) -2.5 (10)	12	12	0.8	None

Preop.: Preoperative; Postop.: Postoperative; LogMAR: Logarithm of Minimal Angle of Resolution; RRD: Rhegmatogenous Retinal Detachment
*The last visit is at the end of March, 2018 except for Case 3. Postoperative best-corrected visual acuity, astigmatism, and intraocular pressure are at the last visit except for Case 3 who died 2 years before

very beginning of surgical management for in-the-bag intraocular lens dislocation.

A technical merit in the superior conjunctiva-sparing intraocular lens-suturing is a method to advance straightened long needles for intraocular lens-suturing from the opposite side and to pierce the needles to the sclera. It is technically easy to pierce the sclera at the desired position 2 mm to 3 mm posterior from the corneal limbus

and to avoid the exact temporal or nasal area where the long posterior ciliary arteries take the route. The anteroposterior position for scleral piercing was set at 2 mm to 3 mm at the borderline of the pars plicata and pars plana to avoid possible iris capture with the intraocular lens [19]. As another merit, the nasal suture and temporal suture for each haptic fixation do not get entangled with each other in surgical procedures to insert the nasal haptic and the lens optic into the posterior chamber at first by pulling the nasal suture. Only after the temporal haptic with suture is compressed below the iris plane into the posterior chamber, the head of a straightened long needle for the temporal haptic can be advanced backward to a limbal side port and then the tip of the needle can be pierced to the sclera on the temporal side.

There have been several different techniques available for surgical management of in-the-bag intraocular lens dislocation. The dislocated intraocular lens can be used to fixate the haptics to the sclera with sutures or by sutureless methods [20]. The dislocated intraocular lens can be alternatively fixated to the iris [21]. It must be emphasized again that there is an option to use the dislocated intraocular lens in itself [22], in contrast with an alternative option to replace the dislocated intraocular lens with a new one, as described in this study. Surgeons can choose a method for the management of in-the-bag intraocular lens dislocation at his or her own discretion, based on the situation of each patient. Under the circumstances, it is important to give consideration for keeping the superior conjunctiva intact at the surgery.

Conclusion

The superior conjunctiva-sparing intraocular lens-suturing is technically feasible and easy to perform at a planned surgery for in-the-bag intraocular lens dislocation. Straightened long needles advanced from the opposite side can avoid the entanglement of two fixation sutures with each other at scleral piercing. Presetting with 25G or 27G vitrectomy trocars through the conjunctiva is required for removing a deeply dislocated in-the-bag intraocular lens in the vitreous, but may be omitted in case of a superficially dislocated intraocular lens near the iris plane. The surgical technique, described in this study, would be useful in patients with exfoliation syndrome which tends to cause both glaucoma and in-the-bag intraocular lens dislocation coincidentally or apart in time in the era with aging population.

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